

20070904.ba v04_n086.bam.20070904

>From ???@??? Tue Sep 4 14:41:20 2007 -0500
Date: Tue, 4 Sep 2007 14:40:02 CDT
From: Old Tube Radios <boatanchors@theporch.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: BOATANCHORS digest 4086
Message-Id: <20070904194003.D342E470189@srvr1.theporch.com>

BOATANCHORS Digest 4086

Topics covered in this issue include:

- 1) Squiers Sanders
by Robert Nickels <W9RAN@oneradio.net>
- 2) Re: Squiers Sanders
by wb3fau@att.net
- 3) test n3lll
by Tom Frobase <tfrobase@kitparts.com>
- 4) OT? Heath IM-25 woes
by Zengmeiste@aol.com
- 5) Re: Heath IM-25 woes
by "David Stinson" <arc5@ix.netcom.com>
- 6) 1940s Civil Defense Abbott VHF Rig
by "David Stinson" <arc5@ix.netcom.com>
- 7) Re: OT? Heath IM-25 woes
by wb3fau@att.net
- 8) Re: OT? Heath IM-25 woes
by "Arden Allen" <gumbear@pacbell.net>
- 9) Re: OT? Heath IM-25 woes
by "Arden Allen" <gumbear@pacbell.net>
- 10) Re: OT? Heath IM-25 woes
by Scott Robinson <spr@earthlink.net>
- 11) Re: 1940s Civil Defense Abbott VHF Rig
by "David Stinson" <arc5@ix.netcom.com>
- 12) More tube noise figures
by Scott Robinson <spr@earthlink.net>
- 13) Re: More tube noise figures
by "Marty Reynolds' debris field" <polepeeg@aa4rm.ba-watch.org>
- 14) 211/LM Fans: The BC-211 Grows Up
by "David Stinson" <arc5@ix.netcom.com>
- 15) Re: More tube noise figures
by "Arden Allen" <gumbear@pacbell.net>
- 16) Re: More tube noise figures
by "Arden Allen" <gumbear@pacbell.net>
- 17) Re: OT? Heath IM-25 woes
by wb3fau@att.net
- 18) Re: More tube noise figures

- by Scott Robinson <spr@earthlink.net>
- 19) Re: OT? Heath IM-25 woes
by Scott Robinson <spr@earthlink.net>
- 20) Video - KSM Station Operations
by Richard Dillman <ddillman@igc.org>
- 21) Re: More tube noise figures
by "Marty Reynolds' debris field" <polepeeg@aa4rm.ba-watch.org>
- 22) Re: More tube noise figures
by "Tom Rauch" <w8ji@contesting.com>
- 23) Re: OT? Heath IM-25 woes
by Richard Loken <richardlo@admin.athabascau.ca>
- 24) 7360 Noise Figure?
by "JAMES HANLON" <knjhanlon@msn.com>
- 25) Re: More tube noise figures
by "Arden Allen" <gumbear@pacbell.net>

Message-ID: <46D9E822.6080403@oneradio.net>
Date: Sat, 01 Sep 2007 17:30:58 -0500
From: Robert Nickels <W9RAN@oneradio.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Squiers Sanders
Content-Type: text/plain; charset=ISO-8859-1; format=flowed
Content-Transfer-Encoding: 7bit

Can anyone offer an opinion as to the going rate for a Squiers Sanders
SS-1R, with the matching speaker and SS-1V band scope?

Thanks and 73,
Bob W9RAN

From: wb3fau@att.net
To: Old Tube Radios <boatanchors@theporch.com>
Cc: Robert Nickels <W9RAN@oneradio.net>
Subject: Re: Squiers Sanders
Date: Sat, 01 Sep 2007 23:10:08 +0000
Message-Id:
<090120072310.18638.46D9F150000A73D1000048CE21603831169A0E00CC0D99@att.net>

I had one about 10 years ago. someone offered me too much money for it, I sold it. a very interesting/ performer. The receivers alone appear from time to time. The band scope and speaker are real tough to find. My guess would be \$1200 or more? I know no body who has one. How about a real clean National NC-183D I am trying to sell? Russ.

Message-ID: <46DA3484.8030708@kitparts.com>
Date: Sat, 01 Sep 2007 22:56:52 -0500
From: Tom Frobase <tfrobase@kitparts.com>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: test n3lll
Content-Type: text/plain; charset=ISO-8859-1; format=flowed
Content-Transfer-Encoding: 7bit

new mail server

From: Zengmeiste@aol.com
Message-ID: <ce5.1a120b61.340b980c@aol.com>
Date: Sun, 2 Sep 2007 00:37:32 EDT
Subject: OT? Heath IM-25 woes
To: Old Tube Radios <boatanchors@theporch.com>
MIME-Version: 1.0
Content-Type: multipart/alternative;
boundary="part1_ce5.1a120b61.340b980c_boundary"

--part1_ce5.1a120b61.340b980c_boundary
Content-Type: text/plain; charset="US-ASCII"
Content-Transfer-Encoding: 7bit

Hi, all.

I think I've CAIG-ed (is that a word?) my IM-25 to death; it was an almost-functional unit to begin with but at least it understood Volts if not Ohms. Izzit really dead do you think? and does anyone happen to have the assembly manual / schematic (s'not on BAMA).

Recommendations and comisseration gratefully accepted.

Thanks a bunch and have a nice (and Safe) holiday.

73, Terry KC9KEL

 Get a sneak peek of the all-new AOL at <http://discover.aol.com/memed/aolcom30tour></HTML>

--part1_ce5.1a120b61.340b980c_boundary
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

* * * * *

* ---REMAINDER OF MESSAGE TRUNCATED--- *

* This post contains a forbidden message format *

* (such as an attached file, a v-card, HTML formatting) *

* Mail Lists at theporch.com only accept PLAIN TEXT *

* If your postings display this message your mail program *

* is not set to send PLAIN TEXT ONLY and needs adjusting *

* * * * *

--part1_ce5.1a120b61.340b980c_boundary--

Message-ID: <002b01c7ed1e\$78f56b60\$6401a8c0@boudreaux>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Heath IM-25 woes
Date: Sun, 2 Sep 2007 00:02:25 -0500
MIME-Version: 1.0
Content-Type: text/plain;
format=flowed;
charset="iso-8859-1";
reply-type=original
Content-Transfer-Encoding: 7bit

It will make a nifty paper weight..... ;-)

Message-ID: <003d01c7ed64\$6fa204b0\$6401a8c0@boudreaux>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: 1940s Civil Defense Abbott VHF Rig
Date: Sun, 2 Sep 2007 08:23:14 -0500
MIME-Version: 1.0
Content-Type: text/plain;
format=flowed;
charset="iso-8859-1";
reply-type=original
Content-Transfer-Encoding: 7bit

If anyone is interested in the 1940s CD "5 meter" radios,
I have a DK-3 by Abbott available.
Looks like the father of their "TR-4" from WWII fame.
Photos at:

<http://home.netcom.com/~arc5/abbott/>

Needs some work but not bad.
\$20 to PayPal plus shipping for 12.5 lbs, 18x18x12 in from 75173
sends it home to you.

73 Dave AB5S
arc5@ix.netcom.com

From: wb3fau@att.net
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: OT? Heath IM-25 woes
Date: Sun, 02 Sep 2007 16:24:25 +0000
Message-Id:
<090220071624.26142.46DAE3B9000999AC0000661E21602807489A0E00CC0D99@att.net>

Take the plunge, go buy a Fluke...

Message-ID: <003101c7ed8d\$5a2b7e80\$5fa0480c@KB6NAX>
From: "Arden Allen" <gumbear@pacbell.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: OT? Heath IM-25 woes
Date: Sun, 2 Sep 2007 11:16:06 -0700
MIME-Version: 1.0
Content-Type: text/plain;
charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

> Recommendations and comisseration gratefully accepted.

Look for cold solder joints. In other words, look for mechanical causes for failure to operate properly. Then go with Ohm's Law. Apply voltages, measure resistors, etc. and analyze each portion of a circuit as you draw it out on a scrap of paper (known as reverse engineering). Only then will a schematic magically appear ;-)

Arden Allen
KB6NAX

Message-ID: <003901c7ed8e\$7f0a7840\$5fa0480c@KB6NAX>
From: "Arden Allen" <gumbear@pacbell.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: OT? Heath IM-25 woes
Date: Sun, 2 Sep 2007 11:24:10 -0700
MIME-Version: 1.0
Content-Type: text/plain;
charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

> > Recommendations and comisseration gratefully accepted.

Mybe this will work better:

<http://www.pestingers.net/PDFs/Test/IM-25-s.pdf>

Arden Allen
KB6NAX

Mime-Version: 1.0
Message-Id: <p06240802c300bac6dc50@[192.168.1.2]>
Date: Sun, 2 Sep 2007 12:11:48 -0700
To: Old Tube Radios <boatanchors@theporch.com>
From: Scott Robinson <spr@earthlink.net>
Subject: Re: OT? Heath IM-25 woes
Content-Type: text/plain; charset="us-ascii" ; format="flowed"

Folks,

I have one of these in working condition, and it's quite a good meter. My Fluke 87 is excellent also, but you need an analog meter for some uses, such as tuning for maximum smoke.

Regards,

Scott

Message-ID: <007301c7eda3\$d9fdce90\$6401a8c0@boudreaux>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: 1940s Civil Defense Abbott VHF Rig
Date: Sun, 2 Sep 2007 15:57:09 -0500
MIME-Version: 1.0
Content-Type: text/plain;
format=flowed;
charset="iso-8859-1";
reply-type=response
Content-Transfer-Encoding: 7bit

Rig has gone to a new home. Thanks all.

Mime-Version: 1.0
Message-Id: <p0624080ac3013277d4eb@[192.168.1.2]>
Date: Sun, 2 Sep 2007 20:43:33 -0700
To: Old Tube Radios <boatanchors@theporch.com>

From: Scott Robinson <spr@earthlink.net>
Subject: More tube noise figures
Content-Type: text/plain; charset="us-ascii" ; format="flowed"

Hi Folks,

I have collected all the ones I calculated for various people and sorted them by increasing Req

For pentodes, it is:

$$R_{eq} = (I_{plate} / (I_{plate} + I_{screen})) \times (2.5 / G_m + 20 I_{screen} / G_m^2)$$

The currents are in Amperes and the transconductances in Mhos.

Some results for pentode amplifiers:

Tube	R eq, ohms
7788	90 (very high Gm pentode)
6GU5	175 (Shadow grid beam pentode)
1/2 -6J6	470 (triode, included for comparison)
6GM6	478 (Frame grid pentode)
6EH7	564 (Frame grid pentode)
6AC7	702
6BZ6	1143
6AG5	1650
6AG7	1540
6CD6	1828
6AK5	1880
6AU6	2660
6BA6	3520

and for mixer tubes:

6BE6	190,000
6SA7	240,000
6SB7-Y	62,000

Regards,

Scott

Message-ID: <4154.66.56.28.127.1188818597.squirrel@fracas.netboobie.org>
Date: Mon, 3 Sep 2007 07:23:17 -0400 (EDT)
Subject: Re: More tube noise figures
From: "Marty Reynolds' debris field" <polepeeg@aa4rm.ba-watch.org>
To: Old Tube Radios <boatanchors@theporch.com>

Cc: boatanchors@theporch.com
MIME-Version: 1.0
Content-Type: text/plain; charset=iso-8859-1
Content-Transfer-Encoding: 8bit

Yo Scott, u sed

> Hi Folks,
>
> I have collected all the ones I calculated for vcarious people and
> sorted them by increasing Req
>
> For pentodes, it is:
>
> $Req = (I_{plate} / (I_{plate} + I_{screen})) \times (2.5/Gm + 20 I_{screen}/Gm^{**2})$
>

good work!

Now, I hope I'm not showing my sitting spot

Where's the source of derivation?

AND why lo Req a good thing. Gess it's a 'generator' in series
with a (transformed) hi-R input ckt &, hence, adds little 'xtra'
to incoming sig.

signed

late-blooming interest

Message-ID: <000901c7ee25\$369a21e0\$6401a8c0@boudreaux>
From: "David Stinson" <arc5@ix.netcom.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: 211/LM Fans: The BC-211 Grows Up
Date: Mon, 3 Sep 2007 07:23:10 -0500
MIME-Version: 1.0
Content-Type: text/plain;
format=flowed;
charset="iso-8859-1";
reply-type=original
Content-Transfer-Encoding: 7bit

If anyone is interested in the "2nd Generation BC-211"
TS-323 VHF freq meter, I have one available in excellent shape

for \$30 plus shipping for 21.5 lbs (18x12x12) from 75173 to PayPal.
Has all the spares, the original antenna
and the original "stud" output connector.
Photos at:

<http://home.netcom.com/~arc5/TS323/>

Thanks!

Message-ID: <006f01c7ee2f\$e98cc960\$b39d480c@KB6NAX>
From: "Arden Allen" <gumbear@pacbell.net>
To: Old Tube Radios <boatanchors@theporch.com>
Cc: "Old Tube Radios" <boatanchors@theporch.com>
Subject: Re: More tube noise figures
Date: Mon, 3 Sep 2007 06:35:53 -0700
MIME-Version: 1.0
Content-Type: text/plain;
 charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

> AND why lo Req a good thing.

Cuz circuits don't work without current. P=IsqR.

Arden Allen
KB6NAX

Message-ID: <007001c7ee2f\$eaa60190\$b39d480c@KB6NAX>
From: "Arden Allen" <gumbear@pacbell.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: More tube noise figures
Date: Mon, 3 Sep 2007 06:39:47 -0700
MIME-Version: 1.0
Content-Type: text/plain;
 charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

Scott confesses:

> I have collected all the ones I calculated for vcarious people

Hmm, were you thinking "vicarious"? Now that's a BA Freudian fumble! ;-)

Arden Allen
KB6NAX

From: wb3fau@att.net
To: Old Tube Radios <boatanchors@theporch.com>
Cc: Scott Robinson <spr@earthlink.net>
Subject: Re: OT? Heath IM-25 woes
Date: Mon, 03 Sep 2007 18:55:08 +0000
Message-Id:
<090320071855.1717.46DC588C0005B3F8000006B521587667209A0E00CC0D99@att.net>

Doesn't your "87 have a bar graph scale? Won't that show- "maximum smoke?"
Russ.

Mime-Version: 1.0
Message-Id: <p06240802c3020b53e776@[192.168.1.2]>
Date: Mon, 3 Sep 2007 12:05:06 -0700
To: Old Tube Radios <boatanchors@theporch.com>
From: Scott Robinson <spr@earthlink.net>
Subject: Re: More tube noise figures
Content-Type: text/plain; charset="us-ascii" ; format="flowed"

Hi Marty,

Source is an equation on page 935 of the Radiotron Designer's
Handbook, 4 th edition (the big one).

The input stage noise can be modeled as a resistor. Resistors make
noise proportional to the square root of the resistance and
bandwidth. It's physics, fancy kinds of resistors do it too...as do
shock absorbers on cars, which are mechanical resistors.

$E_n = \sqrt{4KTRB}$

where K is Boltzman's constant, T is the absolute temperature in deg
Kelvin, R is the resistance, and B is the bandwidth.

This Req will create a noise, even with the grid shorted to ground,
and so is the quietest the radio can get. The actual input stage
noise will be higher, due to the actual input impedance from the
antenna transformer and the antenna itself, which has a resistive
component, transformed by the antenna transformer turns ratio squared.

Radiotron is a truly fascinating book for us Boatanchorites.

Part of the point of this table is that bare converters suck! that
240K Req for a pentagriddy thing ain't gonna let you hear weak
signals; you need an RF amp in front of it. The Halli SX-42 goes even
farther-two 6AG5 RF amps followed by a nice, quiet triode mixer!

Regards,

Scott

```
>Yo Scott, u sed
>
>> Hi Folks,
>>
>> I have collected all the ones I calculated for vcarious people and
>> sorted them by increasing Req
>>
>> For pentodes, it is:
>>
>> Req =( I plate/(I plate + I screen)) x (2.5/Gm + 20 I screen/Gm**2)
>>
>
>
>good work!
>
>Now, I hope I'm not showing my sitting spot
>
>Where's the source of derivation?
>
>AND why lo Req a good thing. Gess it's a 'generator' in series
>with a (transformed) hi-R input ckt &, hence, adds little 'xtra'
>to incoming sig.
>
>
> signed
>
> late-blooming interest
```

Mime-Version: 1.0
Message-Id: <p06240804c3022906dd68@[192.168.1.2]>
Date: Mon, 3 Sep 2007 14:12:43 -0700
To: Old Tube Radios <boatanchors@theporch.com>
From: Scott Robinson <spr@earthlink.net>
Subject: Re: OT? Heath IM-25 woes
Content-Type: text/plain; charset="us-ascii" ; format="flowed"

```
>Doesn't your "87 have a bar graph scale? Won't that show-
>"maximum smoke?" Russ.
```

Sure, in four segments for precision, which it switches back and forth among as needed; not quite what's needed for smoky work.

/scott

Message-ID: <20385512.1188895254208.JavaMail.root@mswamui-valley.atl.sa.earthlink.net>
Date: Tue, 4 Sep 2007 04:40:54 -0400 (EDT)
From: Richard Dillman <ddillman@igc.org>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Video - KSM Station Operations
Mime-Version: 1.0
Content-Type: text/plain; charset=UTF-8
Content-Transfer-Encoding: 7bit

We've added another video on YouTube - the kind radio squirrels like. This one shows the operations at KSM. See everything from Steve testing a 6166 tube with a megger to a RCA "K" set being prepared for use to on the air operations.

Please take a look at:

<http://www.youtube.com/profile?user=RadioKSM>

Enjoy,

RD

=====
Richard Dillman, W6AWO
Maritime Radio Historical Society
<http://www.radiomarine.org>
Collector of Harleys, Willys and
Radios over 100lbs.
=====

Message-ID: <4313.66.56.28.127.1188905346.squirrel@fracas.netboobie.org>
Date: Tue, 4 Sep 2007 07:29:06 -0400 (EDT)
Subject: Re: More tube noise figures
From: "Marty Reynolds' debris field" <polepeeg@aa4rm.ba-watch.org>
To: Old Tube Radios <boatanchors@theporch.com>
Cc: "Old Tube Radios" <boatanchors@theporch.com>
MIME-Version: 1.0
Content-Type: text/plain; charset=iso-8859-1
Content-Transfer-Encoding: 8bit

Yo Scott

u wrote

>
> Source is an equation on page 935 of the Radiotron Designer's
> Handbook, 4 th edition (the big one).
>

TNX 4 TIP - I've got one

>
> Radiotron is a truly fascinating book for us Boatanchorites.
>

OK on what I think is called Boltzman's eqn. Also used to
compute Brownian motion particle velocities items in gasses

> Part of the point of this table is that bare converters suck! that
> 240K Req for a pentagriddy thing ain't gonna let you hear weak
> signals; you need an RF amp in front of it. The Halli SX-42 goes even
> farther-two 6AG5 RF amps followed by a nice, quiet triode mixer!
>

Wonder where this plops the Squires Sanders SS1R? The fella with
the double-balanced (beam-defl 7360) in front. Certainly not a
pentagriddy

again tnx

Marty

Message-ID: <02e501c7ef07\$9b136ea0\$640fa8c0@radiatoroom>
From: "Tom Rauch" <w8ji@contesting.com>
To: Old Tube Radios <boatanchors@theporch.com>
Cc: "Old Tube Radios" <boatanchors@theporch.com>
Subject: Re: More tube noise figures
Date: Tue, 4 Sep 2007 11:23:46 -0400
MIME-Version: 1.0
Content-Type: text/plain;
format=flowed;
charset="iso-8859-1";
reply-type=original
Content-Transfer-Encoding: 7bit

> Wonder where this plops the Squires Sanders SS1R? The
> fella with
> the double-balanced (beam-defl 7360) in front. Certainly
> not a

> pentagriddy

Marty and all,

The story does not end at the equivalent estimated noise resistance of the tube. One of the biggest problems with tubes is the input impedance is very high. This means even though a tube can look really great for NF, the external circuitry might not be able to develop the grid voltage necessary to use the available noise figure. This is a lot of the reason why receivers go dead up towards ten meters. The other reason is the input capacitance of the tube itself.

For example having all the gear to look closely I tried to fix a Heathkit HR10 up on 15 and 10 and I found the thing was limited by the RF coils and wiring, not the tubes or anything fixable.

Actually the noise figure we need when using outside antennas that are reasonably matched isn't really all that low. Propagated noise and local noise even in a very quiet rural location can dominate the receive system even with a NF of 10-15dB.

Two RF amps were probably used either to impress people or to improve image rejection. Most of the better mixers would be quiet enough to set noise floor in the antenna system without an RF amplifier of any type, although some pentagrid tubes might need the help in quiet locations. The problem is all that junk we hang on the grids.

73 Tom

Date: Tue, 04 Sep 2007 11:15:34 -0700
From: Richard Loken <richardlo@admin.athabasca.ca>
Subject: Re: OT? Heath IM-25 woes
To: Old Tube Radios <boatanchors@theporch.com>
Cc: Old Tube Radios <boatanchors@theporch.com>,
Scott Robinson <spr@earthlink.net>
MIME-version: 1.0
Content-type: TEXT/PLAIN; charset=US-ASCII

On Mon, 3 Sep 2007 wb3fau@att.net wrote:

> Doesn't your "87 have a bar graph scale? Won't that show- "maximum
> smoke?" Russ.

Sure, if you like an analogue display that move at rate that competes with
the Athabasca Glacier.

--

Richard Loken VE6BSV, Systems Programmer - VMS : "Anybody can be a father
Athabasca University : but you have to earn
Athabasca, Alberta Canada : the title of 'daddy'"
** richardlo@admin.athabascau.ca ** : - Lynn Johnston

Message-ID: <BAY110-DAV7A189D7DEBCA6EEADD585A0CA0@phx.gbl>
From: "JAMES HANLON" <knjhanlon@msn.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: 7360 Noise Figure?
Date: Tue, 4 Sep 2007 13:30:44 -0600
MIME-Version: 1.0
Content-Type: multipart/alternative;
boundary="-----=_NextPart_000_01A4_01C7EEF7.CBC7F300"

This is a multi-part message in MIME format.

-----=_NextPart_000_01A4_01C7EEF7.CBC7F300
Content-Type: text/plain;
charset="iso-8859-1"
Content-Transfer-Encoding: quoted-printable

Y'all,

I'm just getting back after a week plus of vacation, so pardon me if =
this has already been covered. Late in the tube era, in the mid 60's, =
the 7360 beam-deflection tube was used as a front-end mixer in the =
Squires Sanders SS-1R receiver. I haven't looked it up, but apparently =
William Squires published an article in QST about it, "A new Approach to =
Receiver Front-End Design." (That's according to the reference in =
Raymond Moore's book, Communications Receivers." As I recall, the =
beam-deflection tube was supposed to have a noise figure comparable to a =
good RF pentode and excellent large-signal characteristics. So it could =
be used as a front-end mixer without an RF amplifier ahead of it.

Can anyone fill in more info on this? In particular, how does the 7360 =
noise figure or equivalent noise resistance compare to some of the other =
tubes that have been mentioned?

Jim, W8KGI

-----=_NextPart_000_01A4_01C7EEF7.CBC7F300
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

* * * * *
* ---REMAINDER OF MESSAGE TRUNCATED--- *
* This post contains a forbidden message format *
* (such as an attached file, a v-card, HTML formatting) *
* Mail Lists at theporch.com only accept PLAIN TEXT *
* If your postings display this message your mail program *
* is not set to send PLAIN TEXT ONLY and needs adjusting *
* * * * *

-----=_NextPart_000_01A4_01C7EEF7.CBC7F300--

Message-ID: <003901c7ef2b\$318c02c0\$0da0480c@KB6NAX>
From: "Arden Allen" <gumbear@pacbell.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: More tube noise figures
Date: Tue, 4 Sep 2007 12:38:34 -0700
MIME-Version: 1.0
Content-Type: text/plain;
 charset="Windows-1252"
Content-Transfer-Encoding: 8bit

Scott, the cat dragged this in from the web - Arden

<http://www.john-a-harper.com/tubes201/#Noise>

6. Noise

Basics

All electronic, and indeed electrical, devices produce noise. The most fundamental, and unavoidable, form of noise is called thermal noise or sometimes shot noise. It occurs because the flow of electricity is actually due to individual electrons. Even though the number of electrons is huge, there are still statistically predictable fluctuations, just like traffic on the highway. Because it is random, this noise occurs equally at all frequencies. The noise voltage developed by a simple conductor or resistor is given by:

$$e_{noise} = 2 \sqrt{kTR\Delta f}$$

where: e_{noise} = noise voltage
k = Boltzmann's constant, $1.38e-23$
T = temperature, in J/K

R = resistance
Df = bandwidth (Δf)

For example a 1kW resistor at room temperature (approx. 300Jk), across the audio bandwidth from 0-20kHz, produces a noise voltage of about 0.6μV. When dealing with very small signals, such as a received radio signal or a phono pickup, this is a significant amount of noise.

Vacuum tubes produce thermal noise. They also produce noise in two other ways, called flicker noise and separation noise.

Thermal Noise in Tubes

It turns out that there is a very simple way to calculate the thermal noise in a triode. The noise produced by the tube is equivalent to a resistor in series with the grid, at room temperature, whose value is given by:

$$R_{\text{noise}} = 2.5/G_m$$

In other words, the noise produced by a tube is inversely proportional to G_m . This directly explains the modern interest in high G_m tubes such as the WE417A. This tube was intended for the first stages of sensitive VHF and UHF receivers, where minimum noise is a critical feature, but is also of interest for sensitive phono stages.

Flicker Noise

The second source of noise in tubes is flicker noise, also called 1/f noise which clearly describes its nature: it is noise which decreases with frequency. It is of no interest for radio work, but has obvious importance for audio since most of the noise lies in the audio band. It is particularly important for phono stages, since the RIAA correction, by attenuating higher frequencies, boosts the contribution of noise at lower frequencies.

Flicker noise is caused by variations in cathode emission due to movement of atoms within the cathode structure. In oxide-coated cathodes, it occurs primarily at the interface between the oxide layer and the base metal of the cathode, which is generally a nickel alloy. Some alloys are much better than others in this respect, showing a difference of a factor of 20 or more [Smullin59, p65]. A high silicon content increases flicker noise, but unfortunately has advantages in the manufacturing process and so tended to be widely used. The cathode alloy was chosen by each manufacturer, and does not form part of the specification of a particular tube type, which explains the wide variation about tubes from different manufacturers. Smullin [Smullin59] indicates that European manufacturers tended to use alloys which are better in this respect.

Pure tungsten filaments generate flicker noise in a different way, resulting in a noise spectrum which is $1/f^2$ rather than just $1/f$.

Partition Noise

The third source of noise applies only to tetrodes and pentodes, and explains why pentodes are noisier than triodes. The presence of the positive screen grid means that some of the current (typically 10-20%) from the cathode goes to the screen grid rather than the plate. However this division of current fluctuates randomly, just as the current itself does. This very slight random variation in the plate current is called partition noise.

The effect of partition noise is to change the equivalent noise resistance from the simple formula given above to:

$$R_{noise} = (2.5/G_m)(1+8(I_{screen}/G_m))$$

where: I_{screen} = screen grid current

In practice, this results in three to five times the noise of the equivalent triode. Connecting a tetrode or pentode as a triode eliminates partition noise, since now the two current flows are recombined.

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